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RESEARCH INSIGHTS REPORT The Paper Shortage and its Effects on Mail

Report Number RISC-RI-23-004 | April 20, 2023

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The Paper Shortage and its Effects on Mail

Graphic paper production has been declining for years, and the pandemic accelerated the decline into a graphic paper shortage. What does this mean for the Postal Service and mail?

he production of paper and pulp is one of the largest industries in the world. The global paper and pulp market was valued at \$352 billion USD in 2021 and is an essential component of the materials that make up our everyday lives: tissues, diapers, mail, packages, books, toilet paper, and more. However, the paper market has experienced volatile fluctuations over the past decade. The COVID-19 pandemic made paper an in-demand commodity for manufacturers, shipping companies, and consumers alike as package volume - and a corresponding demand for packaging paper - increased with a rise in ecommerce. As paper producers shifted their mill production towards more profitable packaging paper products, supply for other paper products used by the Postal Service and mailers such as graphic paper - lagged. The U.S. Postal Service Office of Inspector General (OIG)'s objective of this paper is to discuss the major causes of the graphic paper shortage and how this shortage affects the Postal Service and its stakeholders. See Appendix A for more information on the project's scope, objectives, and methodology.

What is Graphic Paper?

The Postal Service uses many types of paper in its services and operations. Cardboard shipping boxes, labels, stamps, and money orders are a few examples of major paper products for the Postal Service. Graphic paper, in particular, is vital to the Postal Service's business structure, as it is used for key products in the Postal Service's daily mail services and operations.

Graphic paper is paper used in communications, such as envelopes, magazines, and stamps. There are two types of graphic paper: printing & writing paper, and newsprint. Printing & writing paper is used in postal products such as catalogs and magazines, stationery and envelopes, and other forms of written communication. Printing & writing paper includes four main paper grades: uncoated woodfree sheet, coated woodfree sheet, coated mechanical, and uncoated mechanical (See Printing & Writing Paper infographic). The other type of graphic paper is newsprint. Newsprint paper is used in newspapers and certain printed advertisements and flyers.

Paper mill factory workers assess their inventory of paper.

Major Causes of the Graphic Paper Shortage

In 2021 and 2022, the world experienced a shortage in graphic paper materials and products. After a dramatic decline in paper demand at the start of the pandemic, demand for graphic paper products sharply increased. From the start of the COVID-19 pandemic to the end of 2022, organizations such as the Postal Service saw sharp increases in graphic paper prices as demand increased and supplies decreased. There are several interconnected factors that led to the current graphic paper shortage, including changes in paper mill production, price changes, and supply chain disruptions.

Shifts in Paper Mill Production and Supply & Demand

The demand for graphic paper has declined gradually overall since the turn of the century, as the rise of digital mediums for business and personal transactions started replacing several written communications. The COVID-19 pandemic, however, sharply shifted the supply and demand for paper over a short period of time. Paper producers had to respond to both of these gradual and dramatic shifts in demand. The way producers responded to the volatile demand within their paper mills affected the supply of paper.

Pre-Pandemic Decline in Demand

Prior to the COVID-19 pandemic, demand for paper overall was decreasing. American consumption of paper shrank significantly since the turn of the century. In 2000, Americans were consuming 93.4 million metric tons of paper annually. American

Figure 1. Printing & Writing Paper

Printing & Writing J Paper

Printing & writing paper — the main type of graphic paper used in written communication such as catalogs, envelopes, and stationary — comes in four main categories.



Source: Printing Impressions, Koncept Analytics

paper consumption remained relatively stable until the Great Recession of 2008, when demand for paper dropped below U.S. supply in 2009. While paper consumption partially rebounded by 2010, the consumption never recovered to pre-Great Recession rates, decreasing gradually until 2020 and the COVID-19 pandemic. By 2020, American paper consumption fell to 63.6 million metric tons, a 32-percent decrease since 2000.

Key Causes of the Graphic Paper Shortage

Demand Changes Paper Production - Pre-Pandemic

Digitalization and rising ecommerce led to a drop in paper demand. Paper mills shifted production away from graphic paper towards packaging papers, and the number of paper companies declined.



Demand Changes Paper Production COVID-19 Pandemic

The COVID-19 pandemic accelerated the decline in paper demand, further decreasing graphic paper production. As schools and work began opening up, demand for graphic paper increased at a time when paper supply was low.

Paper Price Increases

The Producer Price Index(PPI) of pulp, paper, and allied products increased sharply. PPI levels for these products increased only 1.2 percent in the three years between 2017 and 2020 - but rose almost 30 percent in the next two years after that.



Supply Chain Disruptions

Labor shortages, diesel price increases, and a shortage of freight vessels disrupted transportation channels. Paper providers also contended with labor strikes, COVID-19 shutdowns of paper mills, and EU sanctions against Russian paper and pulp. OFFICE OF INSPECTOR GENERAL UNITED STATES POSTAL SERVICE

The overall decline in paper consumption follows the rise of internet use. Digitization reduced the demand for graphic paper. Transactions and communications that were traditionally performed via graphic paper moved online. For example, bank statements or news articles were made available online rather than delivered to an office or residential mailbox. With decreasing graphic paper demand, several paper mills began either scaling back their graphic paper production or shifting their productions to more profitable paper ventures, such as the production of packaging products for rising ecommerce needs.

The North American supply base of paper producers has experienced significant shifts as well. In 1997, the North American paper supply base consisted of over twenty different paper producers, with no one producer holding more than twenty percent of the supply base. This base dramatically shifted by 2022, as the number of paper producers in the supply base shrunk to just a few producers, with one producer holding almost half of the supply base. This shrinking supply base involved not only producers leaving the industry, but also consolidations and mergers of several producers under one company name. When paper producers - which operate paper mills to create paper products - began consolidating, they brought their paper mills to the merger, meaning while there were fewer paper producers, the number of paper mills stayed relatively stable. Therefore, the total number of paper mills did not decrease as significantly as the overall number of North American paper producers.

COVID-19 Pandemic Shifts in Demand

While graphic paper demand steadily declined over the previous decade, the COVID-19 pandemic accelerated the pace of the decline as the economy adjusted to new public health measures. At the onset of the pandemic in 2020, many businesses, governments, and schools quickly shifted operations away from in-person work, and consequently, were not using as much graphic paper. Likewise, the COVID-19 pandemic led some consumers who had kept with traditional paper transactions to transition to online business.

The collapse in demand for graphic paper during the early stages of the pandemic, coupled with labor shortages, led paper producers to shut down, idle operations, or shift operations towards more in-demand paper products. The COVID-19 pandemic accelerated the already increasing use of ecommerce, as consumers sheltered at home and purchased their goods online. Consequently, demand for paperboard -athicker paper type used in packaging and boxing – and packaging paper increased dramatically. Some paper producers that had not closed their mills during the pandemic began converting operations away from uncoated and coated papers towards in-demand packaging paper.

When many schools and offices resumed at least some in-person activities in 2021, demand for graphic paper rebounded and outpaced supply in U.S. paper mills., Earlier decisions to scale back production hindered paper producers' ability to make adequate paper to meet rising demand, as paper producers were still producing paper at 2020 demand levels. Cutting production capacity is a long-term strategic decision, typically including lag time between decision-making and implementation. When demand rebounded in 2021, producers could not quickly scale back up. Additionally, paper producers that changed products away from graphic paper could not easily reverse that business decision, as shifting paper production types is an expensive business venture. Consequently, the capacity to produce graphic paper lagged the increased demand into 2022.

Paper Price Increases

Fluctuations in wood pulp and non-wood pulp prices can affect the production and price of paper. Wood pulp — and, to a lesser extent, non-wood pulp — are key materials in paper production: wood pulp is comprised of wood fibers from deciduous (hardwood) and coniferous (softwood) trees and is used to make newspapers and magazines while non-wood pulp includes cotton and linen fibers and is used to make specialty paper such as money.

The Producer Price Index (PPI) — a measure of wholesale inflation similar to the Consumer Price Index (CPI) — measures average changes in prices paid to producers of pulp and paper, among other goods and services.¹ The price of pulp, paper, and allied products in the aggregate remained relatively steady between 2012 and part of 2020; it then accelerated sharply throughout the pandemic, following a broader trend of inflation. Between August 2017 and August 2020, the PPI levels for pulp, paper and allied products increased by only 1.2 percent; by August 2022, PPI levels rose

Table 1. Producer Price Index Levels, 2017-2022

In general, prices for aggregated pulp, paper, and allied products held relatively steady between 2017 through the beginning of 2020. Prices began to swing upwards later in 2020 and continued to climb over the next several years. Specific paper products – such as writing & printing papers, newsprint, and paperboard – followed this general trend, though PPI levels for paperboard was significantly higher than PPI levels for either writing & printing papers and for newsprint. Prices for wood pulp were more volatile over the same period. Wood pulp prices increased in 2017 and 2018, dropped in 2019 and 2020, and then began climbing again in 2021 and 2022.



Table Notes: Frequency is monthly. Index is not seasonally adjusted. Index base set at 1982=100. Source: U.S. Bureau of Labor Statistics

29.4 percent compared to the same month two years earlier.^{II} PPI levels for specific paper-types also increased starting in late 2020 through 2022 (see Table 1).

Supply Chain Disruptions

The COVID-19 pandemic disrupted the paper industry's supply chain at multiple points. Diesel fuel prices dropped in 2020 and then soared afterwards; meanwhile, a variety of transportation modes along the paper industry's national supply chain experienced labor shortages and slowdowns.^{III} An ongoing shortage of truck drivers worsened during the pandemic, and a reduction in air travel removed threequarters of air freight capacity from the market. Railroads furloughed thousands of workers and took hundreds of locomotives off-line, exacerbating changes that had been introduced earlier with the implementation of "precision scheduled railroading."^{iv} International suppliers pushed back delivery dates due to a lack of ocean freight vessels, a continued container shortage, and labor shortages at shipping ports.

Geopolitical factors further complicated the movement of paper. In the years prior to the pandemic, a gap between consumer



demand for paper and the U.S.'s capacity to produce paper was filled by international paper imports. However, a variety of geopolitical challenges restricted the flow of paper into the U.S. between 2020 and 2022, exacerbating COVID-related supply chain issues. For instance, workers at Finnish paper company UPM – one of the world's largest makers of graphic paper - went on a 16week labor strike in 2022 that caused printing paper shortages throughout Europe. Russia - a major exporter of uncoated papers to the European market - invaded Ukraine in 2022. The ensuing conflict prompted European bans on Russian goods, including bans on wood, pulp, paper, and paperboard. Russia's war against Ukraine also limited airfreight transportation along the AsiaRolls of paper in a paper mill.

Europe lane – which can involve Russian airspace – and disrupted China-Europe rail lines that needed to pass through Russian territory. One envelope manufacturer told the OIG they had seen paper companies remove their Russian operations altogether. Escalating trade tensions between the U.S. and China - another large paper producer created uncertainty in the market. COVID-19 lockdowns in China subsequently shut down mill production and forced organizations that relied on paper from Chinese suppliers to look elsewhere. As a result of national and international supply chain disruptions and lengthening delivery times, paper mills could not always get the materials they needed.

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When companies were able to procure the materials they needed, pandemic-related measures required them to abide by new distancing mandates. Employees did not come into work because they were sick, and plants did not always have enough employees to run machines during shifts. Paper mills had to make the difficult choice between diversifying into new products such as paperboard, idling their mills by temporarily pausing use of their equipment and workforce, or shutting down entirely.

Consequences for the Postal Service

Paper products are vital to the business model of the Postal Service, including for producing its own products and through the mail volumes provided by mailers and shippers. As mail products are made with paper material, any shortage of paper is likely to have effects on the Postal Service and the postal industry. Combined with the previous declines in mailing — along with COVID-19 related economic downsizing in the market the paper shortage could affect the volume of direct mail that stakeholders have sent and the internal operations of the Postal Service.

Effects on the Postal Service's Internal Operations

Paper is an integral part of the Postal Service's operations and products. A variety of paper types are used to produce postal products, such as shipping and operational labels, stamps, money orders, internal mailings, postal marketing direct mail, and operational envelopes. All have been impacted by the paper shortage. Liner papers and stamp papers, in particular, are high-risk products

The **POSTAL SERVICE** and **PAPER**

The Postal Service uses paper in a variety of its operational and retail products

POSTAGE STAMPS

Stamps to demonstrate that postage has been paid are comprised of a linered label using a coated facestock and a separate coated liner stock.



OPERATIONAL ENVELOPES



Adhesive is applied to folded uncoated paper to make operational envelopes. They are used for employee mailings and operational office needs.

MARKETING DIRECT MAIL

Marketing direct mail is made from a variety of coated paper formats. They are used to produce sales materials for employees, customers, and the American public.



LINERED LABELS

Linered labels consist of two paper stock components: a coated face sheet and a silicone coated liner sheet. These labels are used for tagging trays, sacks, containers, and even individual mail pieces.

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because they are impacted by both the paper shortage and an adhesive shortage.

As a large paper user, the Postal Service must rely on more than one paper supplier to fulfill its paper needs. At the same time, inflation in the past year increased the price uncertainty of paper and created further challenges in the procurement of paper products. At one point in 2022, the Postal Service had delayed solicitations for supplies due to the uncertainty of supply prices, including the price of paper products for labels, tags, and boxes.^v At another point in FY 2022, a line closure at a mill delayed shipments of thick card stock on which Postal Service reminder cards were printed.

The Postal Service's Supply Management department monitors these and other trends. It coordinates a cross-functional team to maintain and update the risk status of a variety of paper products used by the Postal Service, including label liner paper, cut sheet paper, and roll paper.^{vi} Using market data from industry reports, news, and supplier meetings, this team assesses the impact of current market conditions and evaluates potential trends for the future.

As of the writing of this paper, the Postal Service has reported that it "has seen significant improvement... with respect to the paper market." While it continues to monitor news of a recent paper mill closing — and has updated the risk status of its associated label liner paper to "High-Risk" accordingly — the Postal Service estimates that future trends for paper products will hold steady or improve. As of the writing of this paper, none of the major paper products under review were estimated to have a negative trend in the near future. In fact, availability of multiple products has improved. In late 2020 and early 2021, for example, the Postal Service classified cut sheet paper and roll paper

INFLATION IN THE PAST YEAR HAS INCREASED THE PRICE UNCERTAINTY OF PAPER AND CREATED CHALLENGES IN THE PROCUREMENT OF PAPER PRODUCTS.

as products with negative trends. Since then, availability of both have reversed and improved, prompting the Postal Service to lower their risk categories to "Moderate Risk".

Effects on the Mailing Industry

The mailing industry was impacted by the changing paper industry and its shifts in specialization. Manufacturers of paper products used by the mailing industry are consolidating and acquiring other companies to diversify their product portfolio. The small manufacturers who specialize in singular paper products are shrinking. For example, some envelope manufacturers have shifted their production to include lightweight packaging to keep up with the changing mail mix. When paper producers switch their specialization away from market-dominant mailing products, the switch impacts the total number of paper companies that mailers – who send market-dominant mail products can work with and the total volume of mailing paper products produced by all suppliers.vii

One category of mailers affected by the paper shortage is direct mailers. Marketing Mail – the class of mail primarily used by direct mailers – accounted for roughly 53 percent of the Postal Service's total mail volume in 2022.viii If direct mailers are unable to find adequate paper supply, they could cut back on the number of mailpieces they send or change their campaign type - which would affect how much mail mailers send through the Postal Service. Some direct mailers have experienced difficulties in procuring paper for their mailing campaigns and have had to test different types of mailing products as a result. Another direct mailer who works with nonprofits told the OIG that direct mail clients are using a variety of techniques to mitigate the effects of the paper shortage and paper price increases. Some direct mailers had to make changes to their campaigns to align with the changing paper supply. For example, some mailers changed to mailing products that used less paper, such as from an envelope to a postcard. A direct mailing service told the OIG some of their nonprofit clients have switched from sending potential donors greeting cards to less expensive bookmarks as a marketing tool.

Some mailers shifted into less expensive paper stock for their mailing programs; however, lower-grade paper stock is often not machinable, causing a potential increase in labor for the Postal Service, an organization that is heavily automated with sorting machinery. The amount of paper required for mailing campaigns is a considerable portion of the total campaign costs, as several direct mailer representatives told the OIG that paper is the second highest cost for mail campaigns behind postage. As the price of paper increased due to lack of supply and inflation, some direct mailers were forced to change mailing strategies to continue their campaigns, especially as the cost of postage has increased twice a year.

Mail products are vital to the business model of the Postal Service. As such, the Postal Service has worked with stakeholders to alleviate supply difficulties. The Postal Service's Mailers Technical Advisory Group created a working group to explore potential solutions on paper issues. The Postal Service's Pricing & Classification Service Center (PCSC) established a process to test mailpieces for possible paper stock, paper grade, and paper weight exceptions to current paper standards. With help from the Postal Service's engineering department, PCSC tested whether lower-quality paper not currently meeting Domestic Mail Manual standards would be machinable in the Postal Service's processing machines.^{ix} The purpose of these tests was to determine if there were exceptions that could be made from these tests that would thereby allow mailers more paper options for their mailing programs. According to the Postal Service, ten machinability tests were conducted with varying results, and the Postal Service received no exception requests to use the tested papers. According to one direct mailing organization, instead of moving to paper exception options, most mailers switched to other direct mail products and packaging styles, with

AS THE PRICE OF PAPER INCREASED, SOME DIRECT MAILERS WERE FORCED TO CHANGE MAILING STRATEGIES TO CONTINUE THEIR CAMPAIGNS.

help from their Postal Service contacts to ensure machinability of these products.

Additionally, the Postal Service has offered support to the mailing industry during the paper shortage through its mailing programs. The Postal Service offers Mailing Promotions to mailers to try new techniques in their direct mailing campaigns. For a discount on their mailings, direct mailers are encouraged to explore new ways to engage customers in their campaigns, whether through innovations in ink and paper stocks or interactive elements of the campaign. In exchange for these innovations, the direct mailer receives a discount in their postage and the ability to try readily available paper products. Mailing promotions and discounts can offset overall costs of a mailing campaign while also providing leeway for alternative paper solutions.

Conclusion

Graphic paper used in envelopes and direct mail – among other operational items – is vital to the Postal Service's business. Disruptions in the graphic paper market have had effects on both the Postal Service and its stakeholders. The graphic paper shortage was caused by several compounding issues, each creating a rippling effect amongst the others. The Postal Service relies on graphic paper products for both its mail volume and operations. Without an adequate supply of paper, stakeholders in the mailing industry are forced to make decisions that could affect the core of their business operations. The Postal Service is potentially impacted by changes made in the mailing industry's mailing campaigns, either through the new types of paper products in the campaigns or a change in mail volumes. Additionally, the Postal Service also experienced challenges procuring paper for its internal operations, such as liner labels and its own marketing mail.

There has been significant improvement in the paper procurement market. The Postal Service has worked with its internal components and mailers to mitigate the effects of the paper shortage through product risk monitoring, paper exceptions testing, and mailing promotions and discounts. As of late 2022, the Postal Service was predicting future paper product trends to hold steady or improve, with the availability of several postal-related paper products increasing. This experience of the Postal Service and its stakeholders during the paper shortage highlights the value of the paper supply chain to the mailing industry OFFICE OF INSPECTOR GENERAL | UNITED STATES POSTAL SERVICE

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Controls in a paper production machine.

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Appendices

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Appendix A: Additional Information

Objective, Scope, and Methodology

The objective of this paper is to describe the major causes of the current graphic paper shortage and to examine how this graphic paper shortage affects the Postal Service and its stakeholders in the mailing industry.

To accomplish our objectives, the OIG conducted research and held interviews with Postal Service's Supply Management department and subject matter experts in the pulp, envelope, and direct mailing

Prior Coverage

industries. Desk research included an examination of external reports and studies to identify major causes and effects of the paper shortage on the mailing industry.

This research was conducted in accordance with the Council of the Inspectors General on Integrity and Efficiency's Quality Standards for Inspection and Evaluation. We discussed our observations and conclusions with management on March 23, 2023 and included their comments where appropriate.

| Report Title | Objective | Report Number | Final Report Date | Monetary Impact |
|--|---|------------------|----------------------|--------------------|
| Inflation and the U.S. Postal Service | To conduct a qualitative assessment of the impacts of inflation on the Postal Service's costs and revenue, to include and highlight how the Postal Service currently manages inflation-related risks. | RISC-WP-22-008 | August 16, 2022 | \$O |

Appendix B: Management Comments





Endnotes

- i The consumer price index (CPI) differs from PPI. While CPI measures changes in prices of goods and services paid by *consumers*, the PPI measures changes in prices to domestic *producers*.
- ii The PPI increase in pulp, paper, and allied products reflects changes found among the PPI of other goods. The PPI value for all commodities also stayed stable between 2012 and 2020 and then rose through most of the pandemic. Between August 2017 and August 2022, the PPI value increased from 193.8 to 269.546, representing an increase of 39 percent.
- iii Between 2017 and 2022, weekly retail diesel prices rose from an average of \$2.65 per gallon in 2017 to \$4.99 in 2022 representing an increase of 88 percent. For more information, see data from the U.S. Energy Information Administration: https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_a.htm.
- iv Bill Stephens, "What is Precision Scheduled Railroading," Trains.com, April 29, 2022, https://www.trains.com/trn/train-basics/ abcs-of-railroading/what-is-precision-scheduled-railroading/.
- v USPS OIG, "Inflation and the U.S. Postal Service," RISC-WP-22-008, August 16, 2022, https://www.uspsoig.gov/sites/default/files/reports/2023-01/RISC-WP-22-008.pdf, p. 12.
- vi Label liner paper is used to tag trays, sacks, containers, and individual mailpieces across USPS operations for processing and movement of mail. Cut sheet paper is used in printing of internal USPS mailings, and roll paper is used when printing internal USPS tag labels, mailings, and forms.
- vii Market-dominant products are products for which the Postal Service maintains a monopoly, including First-Class Mail, Marketing Mail, Periodicals, Special Services and Package Services such as Media Mail, Library Mail, and Bound Printed Matter.

viii USPS, 2022 Report on Form 10-K, https://about.usps.com/what/financials/10k-reports/fy2022.pdf, p. 20.

ix USPS PostalPro, "Paper Availability (06.17.22)," June 17, 2022. https://postalpro.usps.com/node/11026.

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